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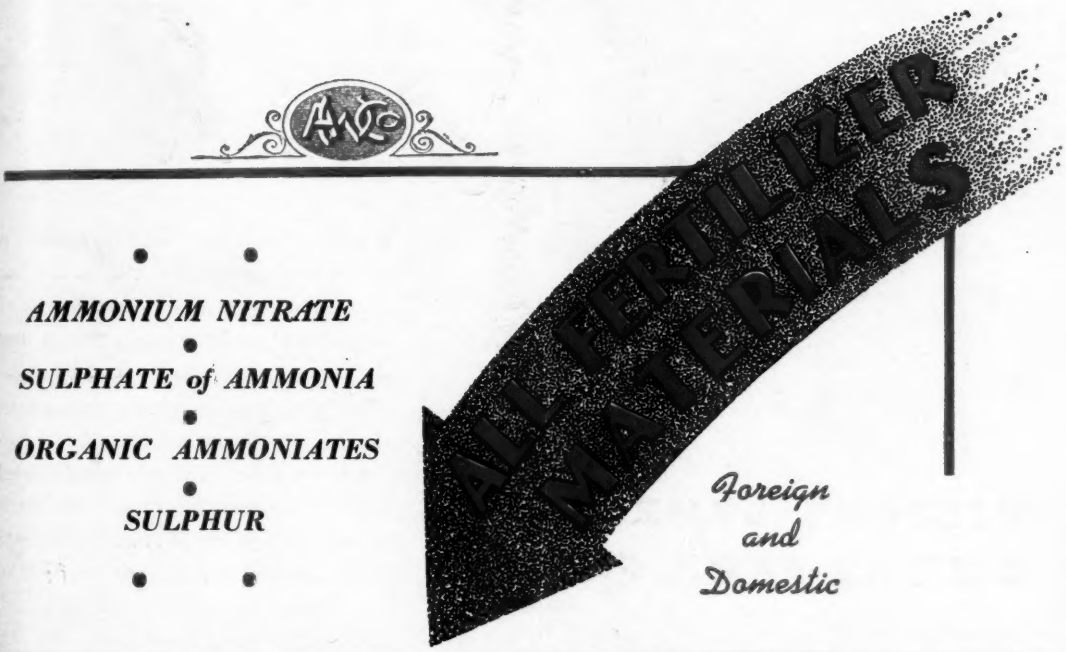

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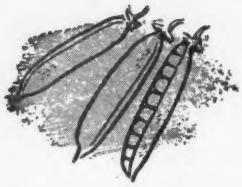

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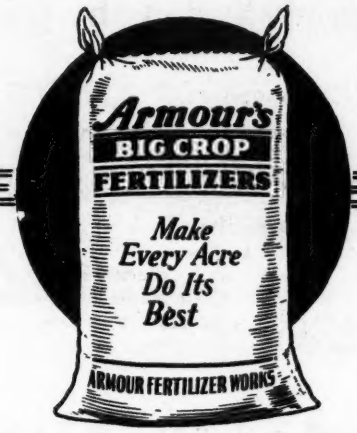
See page 25

Fertilizer Materials



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Vol. 101 SEPTEMBER 9, 1944 No. 5

Phosphates: Present Uses and Future Outlook in Crop Production in the United States

A Challenging Opportunity for the Fertilizer Industry

By VINCENT SAUCHELLI

The Davison Chemical Corporation

"The results emphasize the need of a new approach to the whole problem of phosphate supply for agriculture. The situation is only confused by citing statistics of the sales of fertilizers as a measure of the agricultural need of phosphate. The quantity of phosphate necessary to maintain soil fertility, without which permanent agriculture is doomed, cannot be measured by the amount which farmers have been able to buy under the unfavorable conditions which have prevailed in regard to supply and price . . . the need of agriculture for phosphate should be measured by the amount necessary to maintain permanent agriculture, and it is time to cease measuring need in terms of what the fertilizer industry is prepared to sell."

WITH these challenging and provocative words the Phosphate Committee of the Association of the Land-Grant Colleges placed itself on record at the October, 1943, meeting. The Committee recognized that phosphorus is the key element in any plan to conserve and maintain soil fertility. The Committee also brought out that at least 80 per cent of the soils of the United States are deficient in this element. The extensive field tests of the TVA farm demonstration program have shown that each farm acre requires at least 17 pounds of P_2O_5 for maximum returns. The Committee points out that if 17 pounds of P_2O_5 were applied to each acre of each farm in the humid area of the country, the total annual requirement would be 3,400,000 tons of P_2O_5 (17,000,000 tons 20 per cent equivalent). Some consider the Committee's "17 pounds of P_2O_5 per acre per farm" absurd. Perhaps it is. I cite it here merely to show what is being sponsored by the group. Surely, on productive crop land this amount of P_2O_5 per acre is inadequate. According to the record, the total production of superphosphates in the United States for the 1943–44 year will be close to 7,000,000 tons, 18 per cent equivalent, or only about 41 per cent of the total needed.

We can accept the fact that phosphorus is of vital necessity to man, his crops and his beasts. Science has clearly shown that if this element is lacking in the soil, the crops grown on that soil will be lacking in it, too. Its deficiency furthermore will injuriously affect those animals, and men, who directly or indirectly use such crops for food. Soil surveys reveal that a large majority of the Nation's cropland is deficient in available phosphorus. The average phosphorus content of our soils at present is about one-half that of nitrogen and about one-twentieth that of potash. Many soils contain less than 500 pounds of total phosphorus to the acre: the best estimates are that about 1,500 pounds should be the minimum.

Soil erosion is greatest on land abandoned or near abandonment because its low productivity will not support soil-conserving crops. The most practical way to reclaim eroded land is to stimulate plant growth through proper soil fertilization, particularly by phosphorus. Experience has shown that very often crop yields can be increased 50 to 100 per cent by the right application of a small amount of available phosphates.

To give a more or less general picture of the seriousness of the phosphate problem we reproduce the following data, originally assembled in 1936 by Director J. G. Lipman of the New Jersey Agricultural Experiment Station. The data show conclusively how inadequate has been the rate of phosphorus replenishment.

TABLE I

ANNUAL BALANCE SHEET OF PHOSPHORIC ACID IN THE UNITED STATES

Source	Tons of Phosphoric Acid P_2O_5 Lost or Gained: Gains	Losses
Harvested Crops	—	1,599,046
Grazing	—	3,077,803
Erosion	—	4,993,931
Fertilization	769,971	—
Animal Manure and Bedding	2,478,313	—
Seeds	67,257	—
Totals	3,315,541	9,666,780
		3,315,541
Annual Net Loss		6,351,239

The data indicate an annual net loss of over six million tons of P_2O_5 which is equivalent to about 30 million tons of 20 per cent superphosphate. Just to maintain the phosphorus content of these lands at their present level would require about 30 million tons of superphosphate, 20 per cent basis. Should we, for the purpose of argument, leave out of consideration the estimated loss due to erosion, there still remains a net annual loss from cropping and grazing of more than 1.3 million tons of P_2O_5 or about seven million tons of superphosphate, 20 per cent basis. These figures are huge and are presented merely for the purpose of emphasizing the potential need and market for phosphatic fertilizers. It is realized that it will be many years before the country could possibly balance the phosphorus budget because of the economics involved.

Supply and Consumption of Phosphatic Fertilizers

Up until our entry into this Global War the big problem in the fertilizer industry was how to dispose of all the superphosphate made. Overproduction was an annual headache. Present production is about seven million tons, 18 per cent basis. Superphosphates in 1941 (latest year on which we have complete data) comprised about 47 per cent of all materials used in fertilizer mixed goods. Of the 985,200 tons of P_2O_5 consumed in 1941, about 96 per cent was derived from superphosphates, the remainder from organics such as bone meal, tankage and fish scraps. Commercial organizations distributed 780,200 tons of P_2O_5 and government agencies 205,000 tons P_2O_5. Superphosphate is the only material actually

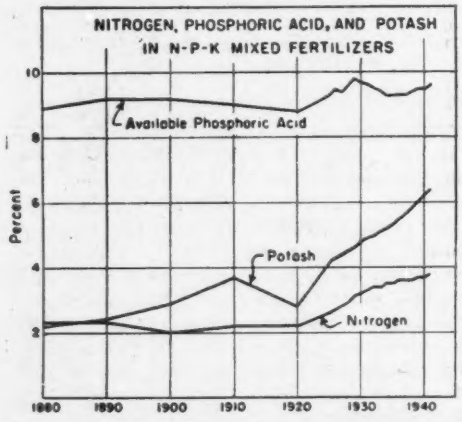

Fig. 1. Percentage of N, P_2O_5 and K_2O in NPK mixed fertilizers, 1880-1941

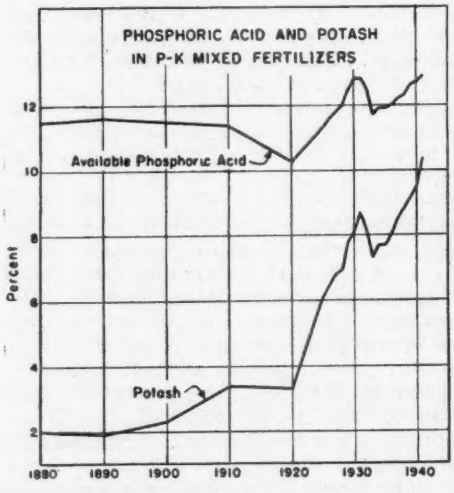

Fig. 2. Percentage of P_2O_5 and K_2O in PK mixed fertilizers, 1880-1941

manufactured in substantial amounts by the mixed fertilizer industry. It has been estimated that the investment in superphosphate plant facilities represents about one-half the total of the industry's production investment.

Considering the enormous stake it has in the expansion of the phosphorus market, it does seem strange that the industry has not sustained intensive propaganda to assure itself of an ever-increasing consumption. It remained, however, for the Federal Government through

The average total available plant food content of all mixed fertilizers consumed in the United States increased as follows, according to Mehring:

1880—13.4 per cent ($N+P_2O_5+K_2O$)
1920—13.9 per cent
1930—17.8 per cent
1935—18.3 per cent
1941—20.2 per cent

The increase for the year 1941 over 1880 is 50 per cent.

TABLE II
AVAILABLE PLANT FOOD CONTENT OF MIXED FERTILIZERS*

Year	Nitrogen Content %	% Increase Over Year 1880	P_2O_5 Content %	% Increase Over Year 1880	K_2O Content %	% Increase Over Year 1880
1880	2.3	..	8.9	...	2.2	...
1920	2.2	0	8.9	0	2.8	27
1930	3.2	39	9.7	9	4.9	122
1935	3.6	56	9.1	2.2	5.4	145
1941	3.8	65	9.7	8.9	6.7	220

*From A. L. Mehring, U. S. D. A.

ts TVA and AAA agencies to arouse the country to the serious depletion of phosphorus in our soils and dietary, and to the urgency of replenishment. Educational programs have been vigorously carried out by the Soil Conservation Service. The result is that this Nation and many foreign countries have become more or less phosphorus conscious. Despite this welcome help, it still seems to me that the superphosphate industry should, in its own interests, take a more active part in selling the country on the essential nature of its phosphate products and its services to public health. Such educational work cannot very well be done by the separate units of the industry; it must and should be organized and supported by the industry as a whole.

Plant Food Content of Mixed Fertilizer

Phosphatic fertilizers, of course, while immensely important in the fertilization of soils, are not the whole story. Nitrogen and potash are also needed. It is quite evident from the trend in fertilizer composition that the producers of nitrogen and potash have been doing a much better promotional job than the superphosphate industry. A glance at Figs. 1 and 2 (from A. L. Mehring, U. S. D. A.) tells the story.

The plant food content of mixed fertilizers consumed in the United States has been gradually increasing. Unless this is considered when analyzing trends, one may be misled because the statistical data are usually based on tons and not on plant food content of fertilizer. Table II summarizes the trend.

Mention was made previously of the activities of government agencies in promoting the use of phosphoric acid. The amount of phosphates distributed through the AAA among farmers since 1934 can be seen from the following tabulation.

TABLE III
PHOSPHORIC ACID (P_2O_5) CONSUMPTION IN THE U. S. A.

Year	Commercially Distributed	Per cent Increase	Government Distributed	Per cent Increase
1934...	530,000	....	0	....
1935...	586,600	10.5	6,170	....
1936...	661,800	12.8	11,100	81.0
1937...	775,100	17.3	20,340	100.0
1938...	708,500	—8.7	35,220	74.0
1939...	709,600	0.1	73,450	109.0
1940...	737,800	3.9	149,700	104.0
1941...	780,200	5.9	205,000	37.0
1942...	984,040	25.6	170,810*	—20.0

*Estimated 18 per cent basis.

It must be remembered that AAA distributed less in 1942 because it was not able to obtain supplies from commercial producers.

Although commercial distribution almost doubled in the period 1934–42, the rate of increase, year by year, relative to that of government distribution is lower. That the government agencies could achieve such enormous distribution in a relatively short time shows what can be done by a well-organized campaign. Indirectly it also demonstrates perhaps that the phosphate industry had not been doing as complete a propaganda job as the opportunity called for.

We saw from Table II how phosphoric acid failed to keep pace with the increase of the other fertilizer ingredients as the total plant food content increased over the last twenty years. Yet all experimental evidence shows that, for best results, fertilizers must be properly balanced. Therefore, the phosphoric acid content should have been increased proportionately. Of course, it has been maintained by some that in the old analyses the P_2O_5 content was too high in relation to the nitrogen and potash in the mixtures. However that may be, the fact remains that consumption of phosphoric acid has not kept up with the Nation's needs. More of it can be sold by increasing the P_2O_5 content of all mixed fertilizers, by increasing their consumption, and by promoting the consumption of superphosphate as a separate fertilizer material.

How to Increase Phosphorus Consumption

The most attractive of these methods to the industry, it seems to me, is that of substantially increasing *total tonnage* consumption of mixed fertilizers. All things considered, however, this may be the least promising. Sales parallel cash farm income, and economic reasons place definite limitations to substantial increases.

Much more can be hoped for by efforts to *increase the P_2O_5 content* of mixed goods. Educational campaigns have been very effective in increasing the nitrogen and potash content of commercial fertilizers. Similar work should be done by the superphosphate industry, and it is reasonable to expect that it would have the support of state and federal agricultural authorities.

Sales of superphosphate as a separate fertilizer material seem to hold the best promise. Both state and federal workers have indicated how unlimited are the possibilities along this line. There has been a traditional hostility among many fertilizer men to the idea of direct sales of superphosphate to farmers. Many of us are familiar with the arguments against such procedure. Yet, if the industry is to make progress and extend its services to the Nation, everyone in it will have to engage wholeheartedly in the promotion of direct sales of superphosphate.

In 1941 the consumption of superphosphate sold direct to farmers was about 1.7 million tons, of which about 804,000 tons were distributed by commercial firms. This was used principally on cultivated crops, winter legumes, in reinforcing manure and on grasslands and pastures. The two most attractive markets for increased sales are for direct application on pastures and grasslands and for conserving manures.

Pastures

The eastern half of the United States has about 100,000,000 acres of permanent pastures. Agronomic research has shown that in the improvement of sod on acid soils the use of lime and superphosphate has given the best return on fertilizer investment. If we were able to get farmers to apply even 100 pounds of 20 per cent superphosphate per annum on even one-tenth of these pastures and grasslands, the total amount of superphosphate needed would be 500,000 tons. If the acreage were increased to one-fifth of the total, or 20 million acres, the superphosphate required would reach the huge total of 1,000,000 tons. This is a big order but the goal is reasonable, not speculative.

The U. S. Department of Agriculture has estimated that the annual manure production in this country is about one billion tons. We know from our own efforts that it is possible to show farmers that it is sound practice to conserve and reinforce manure by means of 20 per cent superphosphate at the rate of about 50 to 100 pounds per ton of manure. Say that one-half of the manure is dropped in the fields and elsewhere and could not be treated. The other half can and should be treated to conserve nitrogen and properly balance the plant foods it contains. Even if only one-tenth of the remainder were to be treated, the amount of superphosphate required at the rate of only 50 pounds per ton reaches the huge total of 1.25 million tons.

Phosphate-containing Fertilizers

So much for direct sales of superphosphate. Let us now consider the possibilities of increasing consumption of mixed fertilizers. This involves considerations of soil types and crops. Dr. Garth W. Volk of the Alabama Experiment Station has pointed out that in 1941 the eastern half of the United States consumed 4,729,050 tons of superphosphate (basis 18 per cent) which represented about 93 per cent of the total. The northern half of this area consumed 53 per cent, the southern half 43 per cent. The average rate of consumption was about 46 pounds per acre. This amount of 18 per cent superphosphate equivalent is based on applications of fertilizer to the principal food, fiber and oil crops. Pastures and grasslands are excluded. The total tonnage may seem large, but actually it represents only about one-fourth of what the amount should have been in the South

(Continued on page 28)

The American Chemical Society

Abstracts of some of the Papers to be presented at the Meeting of the Division of Fertilizer Chemistry at New York City, September 11 to 15, 1944, H. B. Seims presiding.

Abstracts of other Papers from this Meeting were published in the August 26th issue.

Factors Influencing Fertilizer Nitrogen Consumption in the United States

A. L. Mehring, Division of Soil and Fertilizer Investigations, Beltsville, Md.

The consumption of commercial fertilizer nitrogen increased from 19,000 tons in 1880 to about 400,000 tons annually in recent years. Consumption is expected to be about 625,000 tons in 1944 and will probably exceed 700,000 tons in 1945.

Factors affecting fertilizer nitrogen consumption may be divided for convenience in two groups: (1) those that affect total consumption of nitrogen, and (2) those that affect the kind of nitrogen consumed.

A study was made of the following factors: Group 1, (a) cash farm income in the previous season, (b) proportion of the previous year's income remaining after expense of production has been deducted, (c) prospects for farm income in the same season, (d) cost of a unit of nitrogen relative to that of a unit each of P_2O_5 and K_2O, (e) quantity of nitrogen naturally present in the soil, (f) climate, and (g) system of farming. Group 2, (a) cost per unit of nitrogen in various competing forms, (b) properties relating to use in manufacturing mixed fertilizers, and (c) properties relating to efficiency in promoting crop yields in various soils.

Organic Material and Ammonium Nitrate in Fertilizer Mixtures

R. O. E. Davis and John O. Hardesty, Bureau of Plant Industry, Soils, and Agricultural Engineering, U. S. Department of Agriculture, Beltsville, Md.

It is common knowledge that mixtures of nitrates and organic materials give rise to oxidation of the combustible material, but the reaction is usually not sufficiently rapid to result in visible evidence of combustion. Ammonium nitrate shows a tolerance for small quantities of organic materials, but little has been known concerning the action with larger quantities of organics when diluted in mixtures by other fertilizer materials.

Reported evidence of a fire suspected of originating in such a mixture has made it imperative to investigate the combustion probabilities. A base mixture containing 1400 pounds of superphosphate and 400 pounds of ammonium nitrate with as little as 50 pounds of an organic meal has been found capable of originating a fire under unusual conditions. From tests with a variety of mixtures the conclusion is drawn that free acid initially present or formed in the mixture is the primary cause of combustion and that proper neutralization offers safety from fire under severe conditions, even with much larger ratios of organic meal to ammonium nitrate.

Economics of Use of Dolomite in Neutral-Reacting Mixed Fertilizers

S. B. Haskell and Leroy Donald, Barrett Division, Allied Chemical and Dye Corp.

The average net acidity of the nitrogen carriers used in United States complete fertilizers, east of the Rockies, in the 1943–44 fertilizer year was 3.5 tons calcium carbonate equivalent per ton of nitrogen. Because of its low reactivity, dolomite is now being used in mixed fertilizer to neutralize this acidity. Authoritative data as to the extent of use for this purpose are not available, but by comparison with known use of dolomite in the calendar year 1941, not more than 450,000 tons of dolomite are estimated to have been used in 1943–44. Had all the complete fertilizer been treated, the dolomite requirement would have been slightly over 1,000,000 tons. This tonnage is only two-thirds of the quantity of limestone estimated to be needed annually in the State of South Carolina alone; and only about 6 per cent of the quantity of limestone reported to have been used by AAA cooperators in 1942.

Summaries of large numbers of field comparisons, acid versus neutral mixtures, on cotton, show a favorable response to the latter, small in magnitude on an acre basis but highly significant on the basis of increased yield per ton of neutral fertilizer used. That

this response is due to protection against the depletion of bases, the theoretical basis for use of dolomite in manufacture of "neutral" complete fertilizer, rather than to general shortage of available calcium magnesium on cotton soils is not, however, established by the data cited.

Inevitably and unavoidably the dolomite carried in neutral mixtures is high in real cost. The overhead manufacturing, bagging, storing, selling and distribution costs of mixed fertilizers are estimated at not less than $10.00 per ton, or half a cent a pound for space occupied. On this basis the cost of space occupied by the dolomite needed to neutralize an average ton of nitrogen, made up as it was in 1943–44, was about $35.00; or more than three times the cost of the dolomite itself.

Viewed simply as an economic question, dolomite or other limestone, direct from quarry to farm, and use of low-cost acid-reacting nitrogen carriers in mixed fertilizers, in the higher plant food concentrations now possible, are far superior to use of neutral mixed fertilizer. The human equation is, however, involved; and until this is solved, neutral mixtures will continue to serve a definite need.

Boron in Agriculture

E. M. Kitchen, Pacific Coast Borax Co., New York

A paper dealing with the boron deficiency symptoms of plants and some of the more sensitive crops to boron toxicity. New spray work is discussed as well as some developments in pasture tests. Several Kodachrome slides will illustrate the deficiencies.

Manufacture of Concentrated Superphosphate. Laboratory and Plant Studies of the Effect of Mixing and Curing Conditions on Conversion

C. L. Bridger, R. B. Burt, and W. W. Cerf, Tennessee Valley Authority, Wilson Dam, Ala.

Concentrated superphosphate is made in the TVA plant by mixing strong phosphoric acid (about 78 per cent H_3PO_4) with finely ground rock phosphate, curing in large piles for about twelve weeks, grinding, screening, and bagging. Data on the conversion of rock phosphate P_2O_5 to available P_2O_5 for plant superphosphate made from Tennessee and Florida rock phosphate were obtained for a period of several years and compared with corresponding data for control superphosphate prepared in the laboratory. The conversion of the plant superphosphate was lower than that of the control superphosphate, which was attributed to differences in intimacy of mixing, temperature of mixing, and temperature of curing. The effect on conversion of reactant temperature over the range 32° to 200° F. and of curing temperature over the range 80° to 190° F. was determined in laboratory experiments on Tennessee rock phosphate; it was found that both low mixing temperatures and low curing temperatures favor high conversion.

Conserving Laboratory Manpower

Philip McG. Shuey, Shuey & Co., Savannah, Ga.

It is shown that many simple operations, which are largely mechanical, can be improved, resulting in a vast saving in time and energy. Some of these include the proper folding of the filter paper and consequent formation and maintaining of a column of water in the funnel stem when filtering by gravity; the weighing of moistures by difference, using a tare; the use of silver foil on balance pans in weighing samples for analysis; the use of wire gauze over crucibles and dishes in the ignition of precipitates; the substitution of a solution of one strength for another in a procedure when accuracy will not be impaired; the speeding up of the Kjeldahl digestion in the determination of nitrogen; also the shortening of the cooling period between digestion and distillation by the addition of a small amount of water first; making a solution up to known volume and filtering through dry paper instead of washing whenever possible; detection of leaks in a suction line by a simple procedure when the leak is on the front side of the cock; and the use of mechanical stirrers and agitators and having automatic temperature control.

Achieving Balanced Fertilizer Use Through Soil Tests for Phosphate and Potash

Roger H. Bray, University of Illinois Agricultural Experiment Station, Urbana, Ill.

Balance in fertilizer use as far as phosphate and potash is concerned is achieved by so supplementing the soil supplies with added fertilizers, that each nutrient is just at its maximum efficiency. The amount of each nutrient needed for balanced fertilizer use depends on the amount already present in the soil in available form and its availability

(Continued on page 24)

IT MAY BE

By SAMUEL L. VEITCH

LABOR

It may be there will be increasing labor trouble in the months ahead. Veteran re-employment will be one of the bones of contention. Unions and Selective Service now are tangled in a bitter dispute over seniority to be accorded veterans. Selective Service contends a veteran is entitled to "super-seniority," and can bump any civilian worker from his job. Unions argue this policy would ruin labor's seniority program, that veterans are entitled only to seniority accumulated during service, should not displace a worker with higher seniority. You will hear more of this dispute.

Then there is the no-strike pledge. Some WLB officials are advocating another Government-Management-Labor get-together, to handle labor disputes under reconversion. The last meeting, which was in 1941, produced the no-strike pledge. Inside thinking now veers toward a thirty-day "Cooling-off" period before any strikes are called. Chances are that the no-strike pledge won't be given by unions to non-war industries.

Watch the unions go out for higher basic wages to compensate both for reduction in overtime and reported increased efficiency of labor. They will argue that efficiency has been increased faster than wartime wage rates. The Government studies show some doubt on this claim.

COTTON

It may be the cotton situation isn't as healthy as could be hoped for. Prices in world markets are softening. The South may be affected by this downward trend. In fact, Canada is buying cotton from South America because the prices are much cheaper.

FOOD RATIONING

It may be, when you wake up one of these bright mornings, you will find rationing of lots of food items has come to an end. Jones, WFA, is for it. He hasn't been successful in convincing OPA so far, but he will carry the fight higher up.

G. I. BILL OF RIGHTS

It is extremely important for all men and women in the Armed Service to possess a thorough knowledge of Public Law 346—78th Congress (better known as the G. I. Bill of Rights) an Act—"To provide Federal Government aid for the readjustment in civilian life of returning World War II veterans." If anyone desires authoritative rulings on this and similar veterans' laws, they should get in touch with the Veterans' Administration.

FOOD PRICES AND PRODUCTION

Farm prices should slide off before next summer. The downward trend won't be too drastic. Prices at present are 13 per cent above par and with the law fixed at 90 per cent of parity it establishes the maximum of reduction from present prices at 23 per cent. Production next year may be off about 18 per cent. If food prices are off 23 per cent next year and production is down 18 per cent, the combined effect will result in less buying power for the farmer. He just won't have as much money to spend.

OPA's PRICE STABILIZATION

Well, fellows, here we go again. The OPA is going to give us another slow dose of their well-known "trial and error" formula. They are going to try to stabilize prices during the period of industrial reconversion, and before they start, they are going to tell you their plans are tentative. When boiled down that means they don't know where to start or when to stop.

NELSON-WILSON FEUD

You will recall that we have been advising to watch the period of reconversion to civilian goods. The Nelson-Wilson Feud was caused by mixed opinion on the subject. Mr. Nelson is on the side approving immediate reconversion, wherever possible. Mr. Wilson opposed, but Mr. Nelson appears to have won the bout. However, one must say it "appears" Mr. Nelson won, as some are saying Nelson is being buried in China. If he returns from China to his post in Washington, it will be the only way to tell how far he is being supported by the President.

EUROPEAN WAR

It is only a question of how and when the European War ends, whether it is by sudden surrender or gradual disintegration. It is anybody's guess whether the end is 10 days or 10 weeks away. It is certain the end isn't far away.

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Shortage of Sulphuric Acid For Superphosphate Production

Production of superphosphate fertilizers will be adversely affected by industrial shortages of sulphuric acid caused by increased demands of the Army for ordnance requirements and of the Petroleum Administration for War, the War Production Board reported recently.

In view of this reduction of sulphuric acid supplies for industry, the War Food Administration has been notified by WPB that its requirements for the 10,000,000 tons of superphosphate fertilizers will not be fully met, it was reported at an Inorganic Acids Industry Advisory Committee meeting recently. This tonnage is for the fertilizer year July 1, 1944, to June 30, 1945.

According to the current rate of fertilizer production, approximately 8,000,000 tons of superphosphate fertilizers will be available to American farmers for this period. This compares with 6,800,000 tons available in the 1943–1944 fertilizer year.

P. H. Groggins, chief of the Chemicals and Fertilizers Branch of the War Food Administration, pointed out to the committee that from 7,250,000 to 7,500,000 tons of superphosphate are needed each year to replenish ingredients actually removed from the soil, with no additional soil building. In the light of this requirement, he said, a program calling for 10,000,000 tons of superphosphate a year would be essential to supply the American farmers adequately for the present as well as for the period immediately following the war.

To produce 10,000,000 tons of superphosphate, the present production of phosphate rock, averaging 5,250,000 tons a year, would have to be increased by about 1,000,000 tons, WPB said.

Many petroleum refineries formerly using virgin sulphuric acid for uses other than 100 octane motor fuel production will be obliged to accept fortified spent acid for such uses, Chemicals Bureau officials pointed out.

The need for additional tank cars to move Ordnance Department supplies was stressed at the committee meeting. Industry reported that picric acid cars, unused since the last war, could be converted for use in moving sulphuric acid. It may be possible, WPB officials said, that other types of cars (possibly petroleum cars) may have to be converted to the transportation of sulphuric acid, since approximately 300 cars must be added to the acid fleet to meet Ordnance needs.

July Sulphate of Ammonia

The U. S. Bureau of Mines' figures for production of by-product sulphate of ammonia in July showed an increase of 3.7 per cent over the June output. Sales during the same period increased from 42,000 tons to almost 63,000 tons, a rise of 50 per cent. Stocks on hand also increased to 75,000 tons, which constitutes the largest supply for quite a number of months. With the prospective shortage of other forms of chemical nitrogen, it is apparent that all the possible production will be taken up for the coming season.

	Sulphate of Ammonia Tons	Ammonia Liquor Tons NH_3
Production		
July, 1944	68,985	2,601
June, 1944	66,521	2,430
July, 1943	62,145	2,879
January-July, 1944	475,038	18,565
January-July, 1943	438,891	19,838
Sales		
July, 1944	62,954	2,499
June, 1944	42,547	2,330
July, 1943	61,725	2,961
Stocks on Hand		
July 31, 1944	75,376	650
June 30, 1944	69,300	705
July 31, 1943	40,034	957
June 30, 1943	39,568	922

Eastern States Promotes Myers

Eastern States Farmers' Exchange announces that J. Raymond Myers has been appointed superintendent of their Cambridge, Mass., plant. Mr. Myers has been with the Exchange since 1935, having most recently been a field man in Pennsylvania. He succeeds G. H. Moore, superintendent since 1931, who has retired and expects to live on the Eastern Shore at Betterton, Md.

Tennessee Eastman to Handle Manganese Sulphate Sales

Tennessee Eastman Corporation, a subsidiary of Eastman Kodak Company, announces that effective September 1, 1944, sales of their manganese sulphate will be made directly by them from their offices at Kingsport, Tennessee. For a number of years, Eastman's manganese sulphate has been distributed by Harshaw Chemical Company of Cleveland, Ohio.

Eastman originated the first commercial production of manganese sulphate in the United States approximately twenty years ago. Their product is sold under their trade name of "Tecmangam" and is well known throughout the fertilizer trade. Tecmangam is completely water soluble. For this reason, it is frequently applied in a water solution by spraying, as well as in dry mixtures.

Tennessee Eastman Corporation announces that all carload shipments will be made from their plant at Kingsport, Tennessee. For the convenience of less-than-carload buyers, stocks are maintained by distributors throughout the East and Midwest. On the West Coast, stocks are maintained by Wilson & Geo. Meyer & Co., at Los Angeles, San Francisco, Portland, and Seattle.

Culpepper Rejoins Synthetic Nitrogen Products Corp.

To head up expanding sales and agricultural promotion activities, Joe E. Culpepper has rejoined the staff of Synthetic Nitrogen Products Corporation on September 1st. Mr. Culpepper was first employed by the company in 1929 as agronomist in Georgia and Alabama and later directed selling activities in Arkansas, Louisiana and Texas.

For the past ten years Mr. Culpepper has been connected with the American Cyanamid Co. as a district manager.

Mr. Culpepper, who is a graduate of the School of Agriculture at Mississippi State College, will make his headquarters at Charlotte, N. C.

Nitrogen Supplies Curtailed

A reduction of approximately 25 per cent in the amount of ammonia solutions available to private industry has had to be made in the September allocations because of the curtailment of anhydrous ammonia shipments from the Army's ordnance plants, it was stated on August 31st by officials of the Chemicals Bureau, War Production Board.

Shipments of anhydrous ammonia are being tapered off in order to conserve supplies to meet the increased requirements for the material in the expanded munitions production program. Officials could give no indication at this time how long the curtailment of allocations will have to continue, pointing out that this will depend upon the fortunes of war.

They are anything but optimistic of the immediate future for civilian supplies for this and other nitrogen materials, knowing what they do of the new munitions program. They said that unless there is a change in the ordnance program it may be necessary to cutback civilian supplies even further.

In discussing other nitrogen supplies, of-

ficials said that uramon production has been temporarily suspended but hoped that production can be resumed in October on a reduced scale. Ammonium nitrate production for agriculture on the West Coast has been eliminated, but it is hoped that sufficient additional imports from Canada can be obtained in October to make up the deficit.

Production of synthetic nitrate of soda has been temporarily reduced, officials adding that it has been determined that the original forecast on the amount of by-product nitrate of soda to be produced was too high and present indications are that only 60 to 70 per cent of the amount originally forecast will be produced.

A meeting is to be held by the WPB and the WFA in the near future to make an overall survey of the 1944–45 fertilizer season supplies of nitrogenous fertilizers in the light of curtailed sources of supply. Statistical data on supplies and requirements are now being gathered but as yet no date has been set for the meeting.

Obituary

Harold Albert Smith

Harold Albert Smith, president of the Smith Agricultural Chemical Co., Columbus, Ohio, died at his home on August 30th.

Mr. Smith, who was a student at Ohio State University at the time of World War I, enlisted in the Air Corps and served as a lieutenant. After the war, he entered the employ of the company which had been founded by his grandfather. Serving as assistant secretary, he was advanced to vice-president, and in 1931 succeeded his father, Marshall A. Smith, as president of the company.

Mr. Smith was well known and universally liked throughout the industry. Always a strong believer in industry progress, he was an active and enthusiastic member of the Board of Directors of the National Fertilizer Association, and also served on the Middle West Soil Improvement Committee.

He is survived by his wife, Mrs. Elizabeth Welch Smith; a son, Lt. Marshall A. Smith, who is with the Army in England; and two sisters, Mrs. Joseph Vercoe and Mrs. Clarence P. Willcox.

The funeral services, held on September 2nd, were attended by many representatives of the fertilizer industry, including a committee from the Association appointed by President Baylor.

Reginald Totman

Reginald Totman, for the past twenty years associated with the Summers Fertilizer Company's interests, died at Winterport, Maine, August 26th at the age of forty-two. For many years he was located in Baltimore as traffic manager of the Summers Fertilizer Company. He was placed in charge of their terminal operations at Winterport, Maine, in 1938 and later, in conjunction with his terminal duties, was general manager of Summers' potato dehydration operation at Winterport.

Mr. Totman was born at Chelsea, Massachusetts, June 17, 1902. He was a graduate of the Rhode Island School of Design, Providence, R. I., and became associated with Summers in 1924. He is survived by his wife and one daughter; his father, H. E. Totman; three brothers, J. E., F. H., and N. K. Totman, all of Summers Fertilizer Company; and two sisters, Mrs. K. C. Bell of Scarsdale, N. Y. and Mrs. Arnal Bragg of Fairfield, Maine. Funeral services and interment were at Winterport, Maine, August 29th.

BRADLEY & BAKER

FERTILIZER MATERIALS - FEEDSTUFFS

AGENTS - IMPORTERS - BROKERS

155 E. 44th Street
NEW YORK

BRANCHES

Clinton St. & Danville Ave.
Baltimore, Md.

505 Royster Building
Norfolk, Va.

1252 West Beaver Street
Jacksonville, Fla.

504 Merchants Exchange Bldg., St. Louis, Mo.

FERTILIZER MATERIALS MARKET

NEW YORK

Nitrogen Situation Not So Good as Originally Pictured. Less Synthetic Nitrate of Soda than Expected. Superphosphate Production Will Be Curtailed by Shortage of Manpower and Sulphuric Acid.

Exclusive Correspondence to "The American Fertilizer"

NEW YORK, September 7, 1944.

Ammoniates

According to latest information, ammonia solutions for September will be considerably below quantities requested, possibly 25 per cent, which is due to reduction of shipments from ordnance plants.

Ammonium Nitrate

There will undoubtedly be further curtailment of deliveries of this material but it is hoped that Canadian shipments in October or November may take up some of the slack.

Nitrate of Soda

To further complicate the ammoniate situation, there is now an indication that the estimated production of synthetic nitrate of soda is too high and therefore smaller amounts of this material will be available than originally anticipated.

Superphosphate

We have repeatedly advised that the indicated expected production of superphosphate will undoubtedly be curtailed due to the manpower situation. This situation has not improved; in fact, it is probably worse today than it has been, and unless there is a change the expected productions are not likely to materialize. Further sulphuric acid is being diverted from acidulators, which will not help the superphosphate picture.

Potash

Manufacturers of this material, up to this time, have overcome the difficulties of labor and it is expected that anticipated production will be realized. Due to the delay in delivery of machinery needed by one of the smaller manufacturers, shipments from this particular plant will probably be held up about thirty days. However it is expected that the total anticipated production will be shipped during the season.

Phosphate Rock

Deliveries are continuing and probably more rock could be shipped this year than in any previous year, but unless sufficient sulphuric acid is obtained by the acidulators and the manpower shortage is corrected, probably fertilizer manufacturers will not be able to take as much rock as could be delivered.

BALTIMORE

Labor Shortage Handicapping Fall Shipments. Deficit in Mineral Ammoniates Probable. Potash Situation Satisfactory.

Exclusive Correspondence to "The American Fertilizer"

BALTIMORE, September 6, 1944.

The fall shipping season is now on but fertilizer manufacturers are still experiencing difficulty in securing ample labor, although the fall tonnage is small in comparison with the quantities shipped during the spring months.

Ammoniates.—The situation on organic ammoniates is unchanged, and while the demand for feeding purposes has eased up somewhat, the ceiling price for fertilizer is too high for use in fertilizer mixtures.

Castor Pomace.—The situation remains unchanged in that producers are sold up and not taking on additional business either for prompt or future delivery.

Fish Scrap.—The production of fish scrap during the past few weeks has been light due to poor fishing, and there have been no further sales, as producers are delivering against contracts previously booked, subject to catch.

Sulphate of Ammonia.—Due to larger requisitions for liquid ammonia for National Defense purposes, it is beginning to look as though fertilizer manufacturers will encounter shortage of mineral ammoniates. Sulphate of ammonia is still being allocated and based on previous year's deliveries.

HEROES OF WORLD WAR II

The American Farmer **— He, in spite of labor shortages, adverse weather conditions, tool and equipment handicaps, has smashed food production records for eight straight years.**

An award of honor to every producer, packer and shipper of fertilizer. **Every farmer realizes that without fertilizer and the sincere cooperation of this industry he would have failed in so great an undertaking.**

We are proud of the fact **that a great proportion of this fertilizer was packed and shipped in Raymond Multi-Wall Paper Shipping Sacks.**

THE RAYMOND BAG COMPANY

MIDDLETOWN, OHIO.

Nitrate of Soda.—Governmental agencies are endeavoring to increase the importation of Chilean nitrate to offset the deficit in mineral ammoniates, and if this is accomplished it will relieve what would otherwise prove a serious situation.

Superphosphate.—With further requisitioning of sulphuric acid for munition purposes, it would appear that there may be a shortage of superphosphate later on. None of the manufacturers are booking any new contracts, but taking care of their regular customers. The same price of 65 cents per unit of A. P. A. in bulk still prevails.

Potash.—There is no change in the situation, and buyers are now taking deliveries against contracts with every prospect of sufficient tonnage being made available for normal requirements of the coming season.

Bone Meal.—Both raw and steamed bone meal continue in short supply. Prices are comparatively too high based on plant food values as compared to other fertilizer materials, with result that consumption is at its minimum.

Bags.—The market on new burlap bags remains unchanged, but it is anticipated that next spring fertilizer manufacturers will use larger proportion of new burlap bags which are now available for fertilizer purposes without restrictions.

CHARLESTON

Scarcity in Both Organic and Chemical Ammoniates. Shortage of Sulphuric Acid Will Cut Superphosphate Production.

Exclusive Correspondence to "The American Fertilizer"

CHARLESTON, September 5, 1944.

Organics.—No change in this situation and these continue exceedingly scarce.

Ammonium Nitrate.—As previously advised, all shipments of ordnance material to the fertilizer manufacturers were stopped on August 15th, and no new shipments from these sources have been made.

Ammonia Solutions.—These materials for September will be reduced about 25 per cent of the quantity asked for.

Bone Meal.—Very small stock in the hands of producers, and quite a scarcity of raw bone meal. No arrivals from South America for quite some time.

Superphosphate.—The recent cut in sulphuric acid continues and unless this situation is changed, production of superphosphate will fall under expectations.

PHILADELPHIA

Superphosphate Shipments Being Made on Schedule but Later Shortage Expected. More Demand for Feed Materials.

Exclusive Correspondence to "The American Fertilizer"

PHILADELPHIA, September 5, 1944.

While shipments are apparently coming through with little or no delay as yet, the superphosphate situation is demanding attention owing to the shortage of sulphuric acid and labor. It has been reported that some producers of superphosphate have requested delays on shipments of the rock, owing to their inability to process it. This situation, and the cutback in liquid ammonia solution allocations dominated the news during the past couple of weeks.

Ammoniates.—While the past couple of weeks saw a little better supply in the organic materials, yet the prices held at the ceiling, and now we notice a trend toward tightening in the supply position. This was somewhat expected by those in the feed trade, who looked for more demand in the fall. In the inorganic materials, sulphate of ammonia appeared in demand, and also nitrate of soda.

Sulphate of Ammonia.—As mentioned above, there were inquiries for this material, subject, of course, to the allocation regulations, and shipments moved in quantity.

Nitrate of Soda.—It is reported that discussions are under way to bring in a fair tonnage of this product from Chile before the

Manufacturers' Sales Agents for DOMESTIC
Sulphate of Ammonia
Ammonia Liquor :: Anhydrous Ammonia
HYDROCARBON PRODUCTS CO., INC.
500 Fifth Avenue, New York

end of next spring. Present demand is good.

Superphosphate.—The demand is good, while producers are pushed to keep up production, under the difficulties prevailing due to the shortage of sulphuric acid and of labor.

Bone Meal.—Raw bone meal seems to be short and in demand. Supply of all bone meals is low, and demand fairly good.

Potash.—Position of supply and demand remains firm, with buyers taking in as much as they are permitted under the regulations.

Castor Pomace.—Still tight, with most sales to the old customers.

TENNESSEE PHOSPHATE

Heavy Rains Damage Crops and Affect Phosphate Operations. Outlaw Strike Closes One Phosphate Plant.

Exclusive Correspondence to "The American Fertilizer"

COLUMBIA, TENN., September 5, 1944.

Complaints of the drouth were changed in tune last week by a 6-inch rainfall in twelve hours, which brought floods on creeks and rivers and around insufficiently protected parts of grinding, bagging and loading plants, flooded undrained low spots in fields and badly washed some bottom fields. One plant had its facilities so badly affected as to lose an entire week in shipment of bagged goods and confined shipments for that period to bulk.

A handful of men expected out to work in a maintenance crew at one of the phosphate plants last Sunday failed to show up as expected and on Monday morning were discharged by their foreman. Thereupon the entire plant was shut down by a walkout of the CIO employes, which though designated as an unauthorized strike is still under way with more than 200 men out of work while waiting for settlement not yet effected. With three other plants in the field all crying on account of the manpower shortage, especially in grinding, bagging and loading plants, it is hard to understand the labor technique which keeps these men idle while waiting to ascertain if the foreman had a right to discharge a few men in the maintenance department because they failed to show up for expected Sunday work. There are, of course, two sides to the matter of justice or injustice, according to who is talking, but it seems impossible to reconcile a strike in an industry so important to the war effort, at so critical a time as the present, when such adequate machinery is provided for settlement of any such dispute.

It will apparently be again necessary for extension of the date from September 30th, by which time applications of soil improving materials must be made under regulations for receiving AAA benefit credits in the 1944 program, as a very large tonnage is still unshipped and cannot be entirely supplied even before January 1st.

CHICAGO

Fertilizer Organic Market Quiet with Limited Supply Quickly Absorbed. Some Price Concessions in Feed Materials.

Exclusive Correspondence to "The American Fertilizer"

CHICAGO, September 5, 1944.

Quiet conditions generally dominate in the fertilizer organic market with limited available offerings. Whenever such offerings are made, buyers eagerly confirm. It appears at present as though this situation will continue for some time, particularly as there are more buyers than sellers.

The feed market is more or less spotty. Price concessions are being made, particularly on such productions carrying comparatively high freights to mixing centers.

Ceiling prices are:

High grade ground fertilizer tankage, $3.85 to $4.00 ($4.68 to $4.86 per unit N) and 10 cents; standard grades crushed feeding tankage, $5.53 per unit ammonia ($6.72 per unit N); blood, $5.53 ($6.72 per unit N); dry rendered tankage, $1.25 per unit of protein, f. o. b. producing points.

PULVERIZED
MASCOT
LIMESTONE
Trade Mark Registered

MAGNESIUM LIMESTONE
"It's a Dolomite"
American Limestone Company
Knoxville, Tenn.

To keep you supplied with Bags

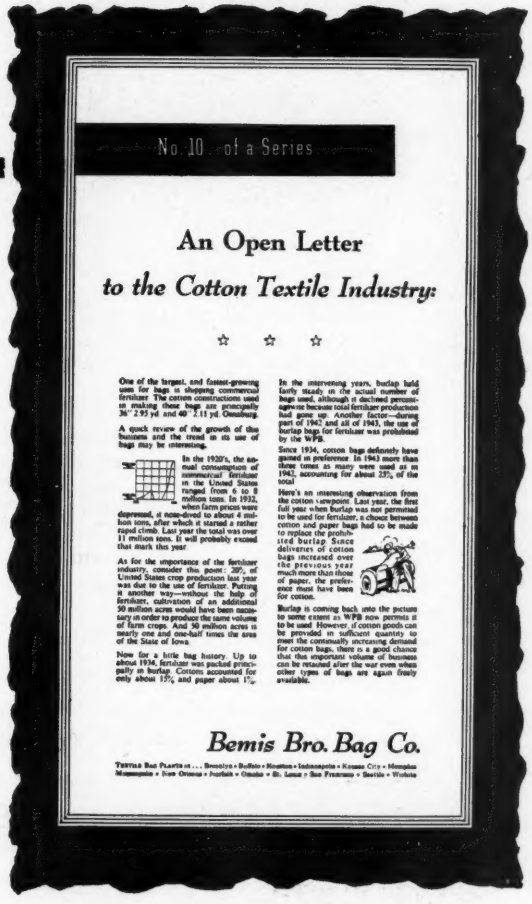
WE'RE NOT OVERLOOKING A SINGLE BET

THERE are many angles to the job of keeping the fertilizer industry supplied with bags in these days of shortages. But we're working on all of them! Here's an example:

A shortage of the necessary cotton cloth is, of course, a bottleneck. So, to supplement our usual close cooperation with the cotton industry, we took an unusual step—

An advertisement, appearing in the leading cotton textile newspaper, told the cotton merchants (1) about the amazing growth of the essential fertilizer industry, (2) the need for bags for fertilizer and (3) the types of cotton goods particularly needed.

The whole object of this unusual undertaking is to create a closer cooperation between the cotton textile and the bag industries . . . *to give you greater assurance of the supply of bags you need.*



No. 10 of a Series

An Open Letter

to the Cotton Textile Industry:

☆ ☆ ☆

One of the largest, and fastest-growing uses for bags is shipping commercial fertilizer. The cotton constructions used in making these bags are principally 36" 2.95 yd and 40" 2.15 yd. Osnaburg.

A quick review of the growth of the business and the trend in cotton use of bags may be interesting.

In the 1920's, the annual consumption of commercial fertilizer in the United States ranged from 6 to 8 million tons. In 1932, when farm prices were depressed, it nose-dived to about 4 million tons, after which it started a rather rapid climb. Last year the total was over 11 million tons. It will probably exceed that mark this year

As for the importance of the fertilizer industry, consider this point: 20% of United States crop production last year was due to the use of fertilizer. Putting it another way—without the help of fertilizer, cultivation of an additional 50 million acres would have been necessary in order to produce the same volume of farm crops. And 50 million acres is nearly one and one-half times the area of the State of Iowa.

Now for a little bag history. Up to about 1934, fertilizer was packed principally in burlap. Cotton accounted for only about 15%, and paper about 1%.

In the intervening years, burlap held fairly steady in the actual number of bags used, although it declined percentagewise because total fertilizer production had gone up. Another factor—during part of 1942 and all of 1943, the use of burlap bags for fertilizer was prohibited by the WPB.

Since 1934, cotton bags definitely have gained in preference. In 1943 more than three times as many were used as in 1942, accounting for about 23% of the total

Here's an interesting observation from the cotton viewpoint. Last year, the first full year when burlap was not permitted to be used for fertilizer, a choice between cotton and paper bags had to be made to replace the prohibited burlap. Since deliveries of cotton bags increased over the previous year much more than those of paper, the preference must have been for cotton.

Burlap is coming back into the picture to some extent as WPB now permits it to be used. However, if cotton goods can be provided in sufficient quantity to meet the continually increasing demand for cotton bags, there is a good chance that this important volume of business can be retained after the war even when other types of bags are again freely available.

Bemis Bro. Bag Co.

TEXTILE BAG PLANTS IN . . . Brooklyn • Buffalo • Houston • Indianapolis • Kansas City • Memphis Minneapolis • New Orleans • Norfolk • Omaha • St. Louis • San Francisco • Seattle • Wichita

This is a greatly reduced reproduction of the advertisement to the cotton textile industry, telling how cotton goods are required for bags for fertilizer. Copy will be sent you on request.

BEMIS BRO. BAG CO.

Baltimore • Boston • Brooklyn • Buffalo • Charlotte
Chicago • Denver • Detroit • East Pepperell • Houston
Indianapolis • Kansas City • Los Angeles • Louisville
Memphis • Minneapolis • Mobile • New Orleans • New
York City • Norfolk • Oklahoma City • Omaha • Peoria
St. Helens, Ore. • St. Louis • Salina • Salt Lake City
San Francisco • Seattle • Wichita • Wilmington, Calif.

East Pepperell, Mass.

New Sulphuric Acid Plants

The War Production Board has listed the following new sulphuric acid plants now under construction, most of which will be in production for the coming fertilizer season:

Company	Annual Additional Capacity	Proposed Completion Date
Summers Fertilizer Company, Searsport, Maine.	25,200 tons	Sept., 1944
Standard Wholesale Phosphate & Acid Works, Baltimore, Md.	109,600 tons	Oct., 1944
Davison Chemical Company, Baltimore, Md.	12,000 tons	Dec., 1944
Virginia-Carolina Chemical Corp., Wilmington, N. C.	25,200 tons	Sept., 1944
General Chemical Company, Front Royal, Va.	65,000 tons	Nov. 15, 1944
	65,000 tons	Feb. 15, 1945
Consolidated Chemical Industries:		
Houston, Texas	108,000 tons	Nov., 1944
Baton Rouge, La.	93,600 tons	Dec., 1944
Stauffer Chemical Company, Dominguez, Calif.	72,000 tons	Sept., 1944
Garfield Chemical Company, Garfield, Utah	54,000 tons	Mar., 1945

Post-war Fertilizer Expansion Predicted

An expansion of fertilizer production is to be anticipated in the years after the war, is the opinion of Dr. R. O. E. Davis, in charge of fertilizer research in the U. S. Department of Agriculture. Plans are already under way which will increase use of fertilizer in helping to meet food and clothing needs of the world at peace. After the war, farmers will have better opportunities to use improved fertilizers and to use them efficiently, Dr. Davis thinks. The benefits from the accumulated results of research should be greater than farmers have ever enjoyed. Plant food in fertilizers used this year represents increases of 43 per cent in nitrogen, 38 per cent in phosphoric acid, and 33 per cent in potash as compared with 1941.

More Oilseed Cake Production

Production of oilseed cake and meal for the first nine months of this feeding year amounted to 5,150,200 tons or 5 per cent more than for the same period a year earlier, according to the *Feed Market Review* for August 24th. Supplies of soybean cake and meal reached a record of 2,663,500 tons, an increase of 7 per cent; supplies of linseed cake and meal totaled 759,200 tons, an increase of 30 per cent; cottonseed cake and meal 1,605,000 tons, a decrease of 7 per cent; and peanut cake and meal totaled 94,400 tons, an increase of 14 per cent.

Research Pays

Corn production in the cornbelt was increased in 1943 by 600 million bushels by the use of hybrid seed, the U. S. Department of Agriculture estimates. Figuring corn at $1 a bushel, that would have paid the state and federal tax bill for all agricultural research for the first forty years of the present century.

In Iowa alone, where ten million acres were raised, the increase due to hybrid corn last year was ninety million dollars—twice as much as the total spent in the whole United States for agricultural research by federal and state governments combined.

CLASSIFIED ADVERTISEMENTS

Advertisements for sale of plants, machinery, etc., and for help and employment, in this column, same type as now used, 60 cents per line, each insertion.

HELP WANTED

WANTED—A fully experienced superintendent for two-way sulphuric acid and phosphate making plant fully capable of operating both departments. Address "650" care THE AMERICAN FERTILIZER, Philadelphia.

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THE AMERICAN CHEMICAL SOCIETY

(Continued from page 12)

for the crop concerned. Since soils vary not only in their relative supplies of phosphate and potash, there is no one mixed fertilizer ratio which can be called a "balanced" fertilizer for any particular crop. For any given crop, the fertilizer ratio changes with the soil supplies as measured by the soil tests. Complete confirmation of this fact has been obtained in work at Illinois which shows that each crop may require a different fertilizer ratio on any one soil and each soil may require a different fertilizer ratio for any one crop.

Present fertilizer ratios are too narrow to be useful for all soil crop relationships. In many cases one will have to resort to using the individual original carriers like superphosphate and muriate of potash in order to achieve a balanced fertilizer use program.

The soil tests for phosphate and potash can now, as the result of recent work, be interpreted in terms of the per cent yield increase which can be obtained for adequate fertilizer use and also in terms of the amounts of both potash and phosphate which constitute adequate fertilizer use. These adequate amounts of either phosphate or potash vary with each soil and their use represents balanced fertilizer use for each soil as far as P and K are concerned. In practice balanced fertilizer use through soil testing is achieved by determining the individual P and K requirements of each individual crop in the rotation and adding them together to obtain the rotation requirement. These rotation requirements are then used on one or more crops in the rotation according to best practices of fertilizer use, which include a knowledge of the relative and absolute needs of each crop for P and K on the particular soil being treated.

As an example one may take the case of a field testing 90 pounds per acre in available potassium and slight minus in available forms of phosphorus. For a rotation like corn, soybeans, oats, and clovers, the average crop yield without treatment would be 82 per cent of the yield which could be obtained with adequate potash and 85 per cent of the yield which could be obtained with adequate phosphate. The product of these two percentages is 70 per cent, meaning that the yield without either P or K is 70 per cent of the yield where they are adequate. A 30 per cent increase in yield for the use of adequate P and K is indicated. This gives a basis for figuring the economics of their use. In addition, from the writers' tables, it is shown that this soil has a four-year rotation requirement of 300 pounds of 0–0–50 and 340 pounds of 0–20–0 for these four crops. Assuming that this rotation and the management system followed supplies adequate nitrogen, this gives the amounts of P and K needed for balanced fertilizer use for this particular soil for the rotation as a whole. Most of it would be used on the clovers to be plowed under for the corn, part may be hill-dropped as 0–9–27 for the corn. Whatever the use for any one year, the objective is to apply approximately the rotation amounts each four-year period.

Effect of Fertilizer Placement on Efficiency of Its Utilization

H. R. Smalley, National Fertilizer Association, Washington, D. C.

Much progress has been made in the past twenty-five years in learning how to apply fertilizers to crops in all sections of the United States, and, through the improvement of fertilizer distributing machinery, the new methods have been adopted in part at least by most fertilizer users.

Experiments to determine the most efficient methods of application have been conducted

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Agricultural authorities have shown that a lack of Boron in the soil can result in deficiency diseases which seriously impair the yield and quality of crops.

When Boron deficiencies are found, follow the recommendations of local County Agents or State Experiment Stations.

Information and references available on request.

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See Page 4

in thirty-five states and on nearly fifty crops. In 1929 only four experiments were conducted on two crops in three states; in 1943 209 experiments were conducted in twenty-six states on thirty-five crops.

There is no one best method of application. Crops vary in their sensitiveness to salt concentration; soils vary greatly in their base-exchange capacity; rainfall and its distribution are important factors; and fertilizers themselves differ considerably. Hence, a method of application that is entirely satisfactory in one area may be very unsatisfactory in some other locality.

Some general principles which have been rather clearly established are: (1) fertilizer should not be applied in direct contact with seed or with the roots of a transplanted plant; (2) for row crops a part of the fertilizer should be applied near the seed and slightly below the seed level, the distances varying somewhat with crop and soil; (3) fertilizer should not be mixed very much with the soil.

The grain crops are exceptions to (1) above. For these crops fertilizer may be drilled with the seed.

Broadcasting and working fertilizer into plowed soil before planting is a poor method, as it allows too much fixation, especially of phosphoric acid, and starts the weeds ahead of the crop. Broadcasting, however, is about the only practical method for applying fertilizer to pastures and haylands.

Some recent experiments indicate that plowing under a part of the fertilizer by applying it in a band on the plow sole may be an efficient method, but some should also be used in the row as a starter.

The Zinc Requirements of Cotton

K. T. Holley and T. C. Dulin, Georgia Agricultural Experiment Station, Experiment, Ga.

Deficiencies developed in cotton plants when grown for a long period in water culture in summer without added zinc, but the results were irregular due to inability to control contamination. About 45 p.p.b. (parts per billion) of the element appeared to be ample for normal growth under these conditions.

With slow-growing fall and winter plants and more exact technique, which is described, severe zinc deficiencies developed in about four weeks. The deficiency resulted in defoliation and finally, in many cases, death of the plants. Under these conditions zinc additions to the substrate at the rate of 4 to 7 p.p.b. were sufficient to protect the plants from the deficiency. This concentration indicates a requirement of 0.025 to 0.050 mg. of the element per plant for the first six weeks of the growth period and that probably 4 to 7 p.p.b. represents the minimum concentration of zinc for growth of cotton.

Capacity to Produce Nitrogen Compounds for Fertilizer Use

Willard C. Cope, War Production Board, Inorganics Branch, Chemicals Bureau, Washington, D. C.

The chemical and physical characteristics of the various inorganic nitrogenous fertilizer materials are discussed with special reference to the compatibility of the mixed chemicals, their adaptability to conditioning fertilizer base and mixed goods, and their ease of handling in several locations, including the tropics.

Data are given on the available supply, including production from industrial plants, imports from Canada and Chile, marginal production, and output channeled into fertilizer use by Ordnance and other government plants.

Tonnage requirements of nitrogen are presented for mixed goods, direct application to growing crops, and export.

The post-war outlook is covered for direct military, Lend-Lease, rehabilitation, export, and civilian uses.

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PHOSPHATES: PRESENT USES AND FUTURE OUTLOOK

(Continued from page 10)

alone, had the fertilizer recommendations of the local experiment stations been followed. The same total is certainly very much less than one-fourth of what is recommended officially in the North. The 1943–44 estimated production of 7,000,000 tons of superphosphate (basis 18 per cent) is just about enough to furnish an average of about 68 pounds of superphosphate (18 per cent) per acre on the cropland area of the South. These rough calculations emphasize how inadequate is the present phosphate fertilization of croplands in this country. This will be shown in greater detail in what follows.

Podzolic Soils Area

One-fourth the area of the United States (470 million acres) comprises what is known as the region of podzolic soils. Most of these soils lie east of the Mississippi. They all show a phosphorus deficiency. The region is otherwise favorable to the growth of food, fiber and oil crops and to the maintenance of dairy and animal industries. In 1941 this region consumed 2,700,000 tons of superphosphate (basis 18 per cent) or an average of only 37 pounds per acre on land planted to the crops listed in the war production goals[1]. The list excludes pastures.

Pastures are an important potential market, especially in the South and Northeast, because in the future the dairy and animal industries are going to be compelled to give more consideration to pasture management as a source of feed. This will provide a big future outlet for phosphates. If we assume for the sake of argument that only 65 per cent of the podzolic soils are deficient in phosphorus, the total amount of superphosphate produced in 1941, if distributed uniformly on crop lands in this region, would provide an average of only about 10.3 pounds of P_2O_5 or say 57.2 pounds of 18 per cent superphosphate per acre. State experiment station results show definitely that this amount is far below that which should be used. Phosphorus replenishment in the entire eastern United States at present rates of fertilization is totally inadequate, and unless it is increased it will lead to uneconomic crop yields.

Crop Response to P_2O_5

Is there a reasonable estimate of what constitutes an economic amount of P_2O_5 to be used on each crop in this region? Experiment station results give us the most dependable answer. Since the podzolic soils region is very extensive and crop response varies much within the region, a statistical average quantity may not mean much. However, it is the best we can do. From experiment stations come the data in Table IV which gives a résumé of some crop responses to P_2O_5 treatments on phosphorus deficient soils. From these data can be calculated estimates of what should be economic applications of P_2O_5 for each crop[2].

TABLE IV

PODZOLIC SOILS REGION. CROP RESPONSE TO P_2O_5. SOILS DEFICIENT IN AVAILABLE PHOSPHORUS

Crop	Pounds P_2O_5 per Acre	Expected Increase in Yields
Potatoes	80–100	40–100 bu.
Pastures	90–120	200–1,000 lb. dry wt.
Corn	20–80	5–25 bu.
Grains	20–76	8–12 bu.
Hay	P_2O_5 residual from previous grain crop	700–3,000 lb.

What do these figures tell us? From experience and field tests it is known that the minimum P_2O_5 requirements of the crops listed in the table are much higher than the average amount of P_2O_5 actually used in 1941. If 65 per cent of the land planted only to the crops listed in Table IV were to be given the average treatment of P_2O_5 as calculated previously (10.3 lb.), a total of 1,300,000 tons of P_2O_5 would be required; this quantity is about 2.5 times as much P_2O_5 as was used in 1941 *on all crops* in the region. If we add to the list of crops in Table IV the other important crops such as truck and fruit crops, soybeans, sugar beets, beans, peanuts, tobacco and others, the total would be enormously increased. I know of no sounder arguments to impress the fertilizer industry on the wonderful opportunity it faces to improve and safeguard the health of the Nation and to

[1]Data from G. W. Volk.

[2]Data from G. W. Volk.

How to prevent inflation in one easy lesson

Put that money back in your pocket!

When a lot of people want the same thing, its price goes up.

Americans have more money today—much more—than there are things to buy with it.

So every big or little thing you buy—that you can possibly do without—cuts supplies and bids prices up on what is left.

Rising prices spell inflation. And every inflation has been followed by a cruel and bitter depression . . . men out of work, homes lost, families suffering.

We don't want inflation: we don't want another depression.

4 THINGS TO DO to keep prices down and help avoid another depression

1. *Don't* buy a thing you can do without.
2. *Never* pay more than the ceiling price. Always give stamps for rationed goods.
3. *Don't* take advantage of war conditions to fight for more money for yourself or goods you sell.
4. *Save.* Buy and hold all the War Bonds you can afford—to help pay for the war and insure your future. Keep up your insurance.

HELP US KEEP PRICES DOWN

A United States War message prepared by the War Advertising Council; approved by the Office of War Information; and contributed by this magazine in cooperation with the Magazine Publishers of America.

conserve our soil resources. Of course, to reach these goals will require a great deal of effort, time and money to educate farmers and its own sales forces; but is not the reward worth it all?

Phosphates in the South

About 40 per cent of the phosphate sold in the United States is used on crops in the South. Cotton and corn in 1938 received about 43 per cent of the total fertilizer distributed in this country. While we do not have official figures for 1944, it is safe to say this proportion has not changed significantly. These two crops are the most extensively grown in the South. Corn following a crop that has been well fertilized with phosphate can get along well enough without additional phosphate. Since peanuts now grow on many acres formerly given to cotton, corn is now being planted on soils deficient in phosphorus, and it is necessary to apply about 25 pounds of P_2O_5 per acre to get good average yields. Cotton everywhere responds to P_2O_5 applications; it requires about 40 to 50 pounds per acre for good yields. Legumes in the South need about 50 pounds P_2O_5 per acre for good yields; pasture lands about the same. Tobacco needs 70 to 100 pounds P_2O_5 for good commercial yields. Peanuts do best if they get about 25 to 36 pounds of P_2O_5 per acre.

As previously stated, farmers in the South have been using an average of about 40 per cent of the phosphate sold in the United States. If they were to use P_2O_5 at the rate recommended by their respective stations, the total consumption would be, according to Dr. Volk's estimates, about 6,000,000 tons of 18 per cent superphosphate. Fantastic? Perhaps, but surely not an impossible goal. In 1941 this same area consumed only about 2,000,000 tons, or roughly only one-third of what it needed. This amount was sufficient to supply only about 12 pounds of P_2O_5 per acre for those crops listed in the 1943 War Production Food Goals. That list omits many important crops on which some fertilizer is used.

Desert Areas

West of the Mississippi in the semi-arid and desert regions some phosphate is required. Table V summarizes what phosphorus has done in increasing yields in this region, which includes also the high rainfall areas of California, Oregon, Washington and Idaho.

New Plant Construction in 1944

Authority has been given by WPB for the construction during 1944 of six new superphosphate plants and one triple superphosphate plant. These new plants will be widely scattered. Texas will have the triple and one normal superphosphate, and the other normal superphosphate plants will be located one in each of the following states: Maine, Missouri, Louisiana, Idaho and California. These developments it is expected are a direct response to normal increases in local requirements.

Conclusion

We have given a broad, and necessarily general, survey of the present status and future outlook of the market possibilities of superphosphates. The consumption of this commodity can and should be increased. The need for more phosphorus on our crop lands and grazing lands has been convincingly demonstrated by experience and research. The post-war period is a challenge to the superphosphate industry to serve the Nation and itself in a positive and constructive way.

TABLE V

RESPONSE TO PHOSPHORUS IN DESERT REGIONS

Phosphate	Rate: Lb. per Acre	Yield per Acre					
		Alfalfa Tons	Sugar Beets Tons	Canning Peas Tons	Tomatoes Tons	Cotton Lb.	Potatoes Bu.
None	...	5.04	7.93	2.88	15.94	868	99
Triple	135	7.68	*	*	*	860	*
Triple	100	*	12.45	*	*	*	116.2
Triple	200	*	12.81	2.89	20.85	*	119.8

*Not included in test.

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For Alphabetical List of Advertisers, see page 33.

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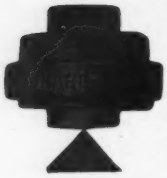

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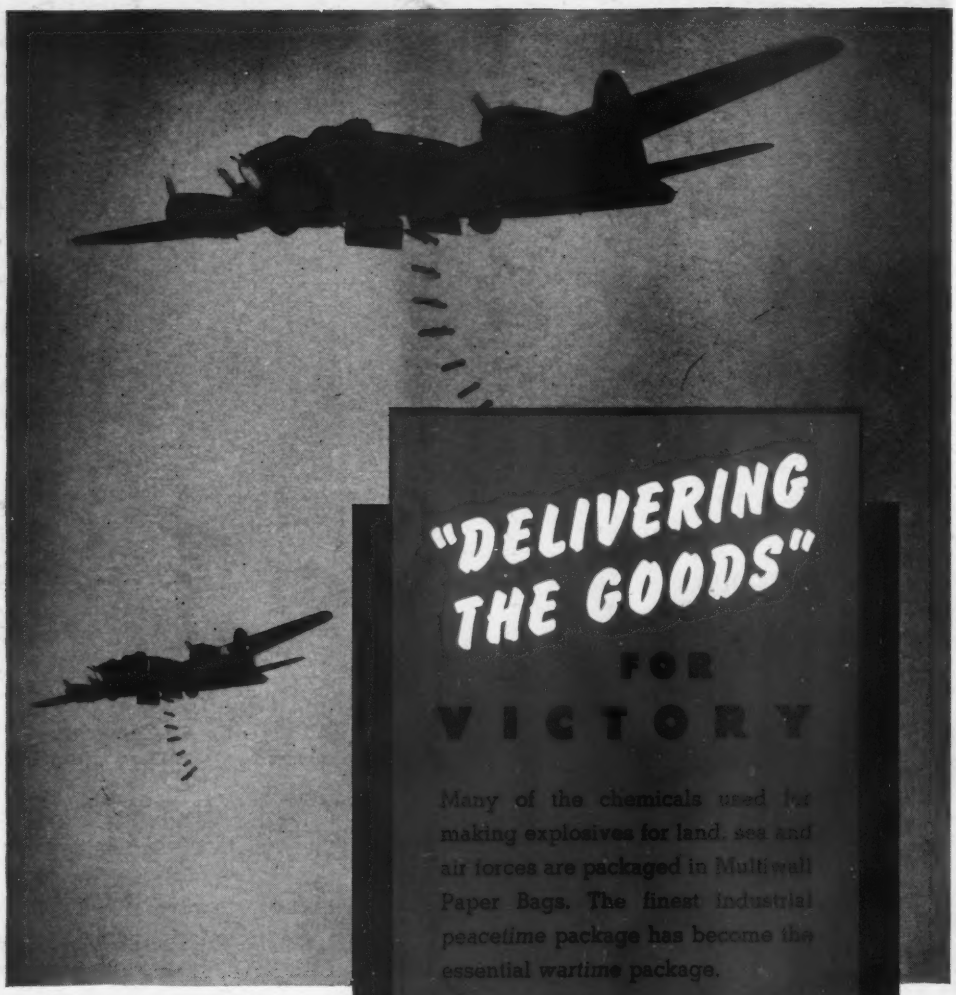

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